

CLAIMS

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1. A safety verification device of a reactive system represented by a set of function symbols, a set of rewriting rules, a set of axioms, a set of terms, and a set of terms to be
5 verified,

said set of axioms being a set consisting only a commutative law and an associative law, and

said safety verification device of a reactive system comprising:

10 a translation unit generating, under said set of axioms, a first equational tree automaton which accepts said set of terms, a simulation unit generating, under said set of rewriting rules and said set of axioms and using said first equational tree automaton as initial data, a second equational
15 tree automaton which accepts said set of terms and a set comprising terms derived from said set of terms, and a set operation unit which generates a fourth equational tree automaton by associating said second equational tree automaton with a third equational tree automaton which
20 accepts said set of terms to be verified and determines whether or not a set accepted by the fourth equational tree automaton is an empty set.

2. A safety verification device of a reactive system represented by a set of function symbols, a set of rewriting
25 rules, a set of axioms, a set of terms, and a term to be verified,

said set of axioms being a set consisting only a commutative law and an associative law, and

said safety verification device of a reactive system comprising:
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a translation unit generating, under said set of axioms, a first equational tree automaton which accepts said set of terms, a simulation unit generating, under said set of rewriting rules and said set of axioms and using said first
35 equational tree automaton as initial data, a second equational

tree automaton which accepts said set of terms and a set comprising terms derived from said set of terms, and
a set operation unit determining whether or not said second equational tree automaton accepts said term to be verified.

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3. A safety verification device of a reactive system according to claim 1 or 2, wherein said set of function symbols is a set comprising function symbols representing encryption, decryption and communication processing as elements,

10 said set of rewriting rules is a set comprising as an element a rule representing that encrypted information is returned to plaintext by decryption,

said term to be verified is confidential information, and

15 said set of terms is a set of knowledge of each of subjects that exchange confidential information, and a set of knowledge of a subject that monitors the information exchanged between said subjects.

20 4. A safety verification method of a reactive system represented by a set of function symbols, a set of rewriting rules, a set of axioms, a set of terms, and a set of terms to be verified,

said set of axioms being a set consisting only a commutative law and an associative law, and

25 said method comprising:

a first step of generating, under said set of axioms, a first equational tree automaton which accepts said set of terms,

a second step of generating, under said set of rewriting rules and said set of axioms and using said first equational tree automaton as initial data, a second equational tree automaton which accepts said set of terms and a set of terms derived from said set of terms, and

30 a third step of generating a fourth equational tree automaton by associating said second equational tree automaton

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with a third equational tree automaton which accepts said set of terms to be verified and determining whether or not a set accepted by the fourth equational tree automaton is an empty set.

- 5 5. A safety verification method of a reactive system represented by a set of function symbols, a set of rewriting rules, a set of axioms, a set of terms, and a term to be verified, said set of axioms being a set consisting only a commutative law and an associative law, and
- 10 said method comprising:
- a first step of generating, under said set of axioms, a first equational tree automaton which accepts said set of terms, a second step of generating, under said set of rewriting rules and said set of axioms and using said first
- 15 equational tree automaton as initial data, a second equational tree automaton which accepts said set of terms and a set of terms derived from said set of terms, and
- a third step of determining whether or not said second equational tree automaton accepts said term to be verified.
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6. A safety verification method of a reactive system according to claim 4 or 5, wherein said set of function symbols is a set comprising function symbols representing encryption, decryption and communication processing as elements,
- 25 said set of rewriting rules is a set comprising as an element a rule representing that encrypted information is returned to plaintext by decryption,
- said term to be verified is confidential information, and
- 30 said set of terms is a set of knowledge of each of subjects that exchange confidential information, and a set of knowledge of a subject that monitors the information exchanged between said subjects.
- 35 7. A computer-readable recording medium containing a

reactive system safety verification computer program, comprising:

5 a first program code which accepts an input of a
 procedure represented by a set of function symbols, a set of
 rewriting rules, a set of axioms, a set of terms, and a set of
 terms to be verified,

 a second program code which generates, under said set
 of axioms consisting only of a commutative law and an associative
 law, a first equational tree automaton which accepts said set of
 terms,

10 a third program code which generates, under said set of
 rewriting rules and said set of axioms and using said first
 equational tree automaton as initial data, a second equational
 tree automaton which accepts said set of terms and a set of terms
 derived from said set of terms, and

15 a fourth program code which generates a fourth
 equational tree automaton by associating said second equational
 tree automaton with a third equational tree automaton which
 accepts said set of terms to be verified and determines whether
 or not a set accepted by the fourth equational tree automaton is
20 an empty set.

8. A computer-readable recording medium containing a
safety verification computer program, comprising:

25 a first program code which accepts an input of a
 procedure represented by a set of function symbols, a set of
 rewriting rules, a set of axioms, a set of terms, and a term to
 be verified,

 a second program code which generates, under said set
 of axioms consisting only of a commutative law and an associative
30 law, a first equational tree automaton which accepts said set of
 terms,

 a third program code which generates, under said set of
 rewriting rules and said set of axioms and using said first
 equational tree automaton as initial data, a second equational
35 tree automaton which accepts said set of terms and a set of terms

derived from said set of terms, and

a fourth program code which determines whether or not said second equational tree automaton accepts said term to be verified.

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9. A computer-readable recording medium containing a reactive system safety verification computer program according to claim 7 or 8, wherein said set of function symbols is a set comprising function symbols representing encryption, decryption and communication processing as elements,

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said set of rewriting rules is a set comprising as an element a rule representing that encrypted information is returned to plaintext by decryption,

said term to be verified is confidential information,

15 and

said set of terms is a set of knowledge of each of subjects that exchange confidential information, and a set of knowledge of a subject that monitors the information exchanged between said subjects.

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10. A computer program data signal embodied in a carrier wave for reactive system safety verification, comprising:

a first program code which accepts an input of a procedure represented by a set of function symbols, a set of rewriting rules, a set of axioms, a set of terms, and a set of terms to be verified,

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a second program code which generates, under said set of axioms consisting only of a commutative law and an associative law, a first equational tree automaton which accepts said set of terms,

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a third program code which generates, under said set of rewriting rules and said set of axioms and using said first equational tree automaton as initial data, a second equational tree automaton which accepts said set of terms and a set of terms derived from said set of terms, and

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a fourth program code which generates a fourth equational tree automaton by associating said second equational tree automaton with a third equational tree automaton which accepts said set of terms to be verified and determines whether
5 or not a set accepted by the fourth equational tree automaton is an empty set.

11. A computer program data signal embodied in a carrier wave for reactive system safety verification, comprising:
10 a first program code which accepts an input of a procedure represented by a set of function symbols, a set of rewriting rules, a set of axioms, a set of terms, and a term to be verified,
a second program code which generates, under said set
15 of axioms consisting only of a commutative law and an associative law, a first equational tree automaton which accepts said set of terms,
a third program code which generates, under said set of rewriting rules and said set of axioms and using said first
20 equational tree automaton as initial data, a second equational tree automaton which accepts said set of terms and a set of terms derived from said set of terms, and
a fourth program code which determines whether or not
said second equational tree automaton accepts said term to be
25 verified.

12. A computer program data signal embodied in a carrier wave for reactive system safety verification according to claim 10 or 11, wherein said set of function symbols is a set
30 comprising function symbols representing encryption, decryption and communication processing as elements,
said set of rewriting rules is a set comprising as an element a rule representing that encrypted information is returned to plaintext by decryption,
35 said term to be verified is confidential information,

and

said set of terms is a set of knowledge of each of
subjects that exchange confidential information, and a set of
knowledge of a subject that monitors the information exchanged

5 between said subjects.